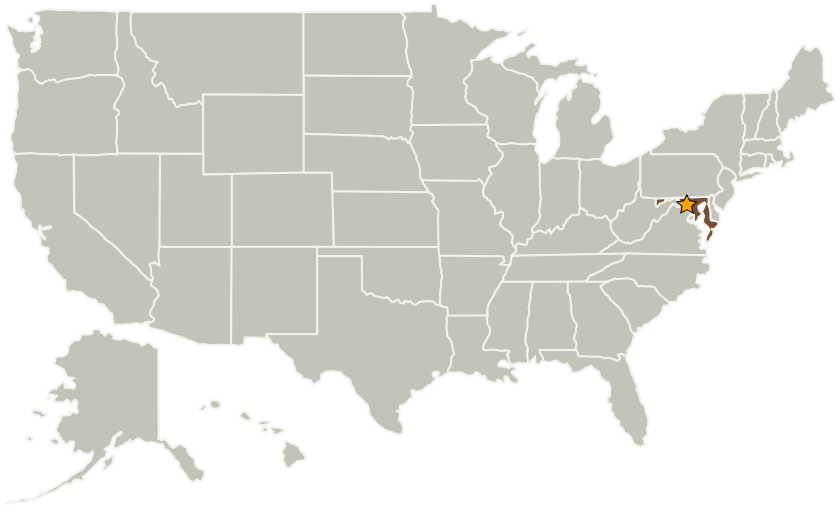
Monolithic Time Delay Integrated APD Arrays, Phase I

Completed Technology Project (2007 - 2007)

Project Introduction

The overall goal of the proposed program by Epitaxial Technologies is to develop monolithic time delay integrated avalanche photodiode (APD) arrays with sensitivity and dynamic range at least an order of magnitude better than currently available ladar sensors and free-space optical communication terminals. We will accomplish this by monolithically integrating on the same chip, APD arrays with transimpedance amplifiers (TIA) incorporating novel time delay integration elements. In Phase I of this project, we will design, model and simulate the performance of 1064-nm APD array chips with built-in time delay integration (TDI) elements that will enable sensitivity enhancement by as much as a factor of 32 compared to the performance of existing APD arrays. In Phase II, we will design, fabricate and test 32 x 32 TDI APD arrays and (1 x 16) monolithic photoreceivers with TDI unit cells. We will use microlens technology to further improve the fill factor to 90%. Finally, we will combine the arrays with readout integrated circuits (ROIC) using an innovative bonding technique at the wafer level and deliver packaged sensor units to NASA GSFC.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Epitaxial Technologies, LLC	Supporting Organization	Industry	Baltimore, Maryland

Primary U.S. Work Locations
Maryland

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes